USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003NY23B

Title: Evaluating the Flow and Treatment of Contaminants in Urban Storm Water Infiltration Basins

Project Type: Research

Focus Categories: Hydrology, Water Quality, Floods

Keywords: stormwater, runoff, infiltration

Start Date: 03/01/2003

End Date: 02/28/2004

Federal Funds Requested: $0.00

Matching Funds: $23835.00

Congressional District: 22

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Abstract: Problem:
The management and treatment of storm water runoff in highly urbanized areas with substantial impermeable surfaces presents a major challenge. Large quantities of runoff are generated from impermeable surfaces, yet few locations exist for adequate storage and treatment of the runoff. This creates a scalar problem of maximizing the storage, reuse and storm water treatment area with respect to the impermeable area. Since most surface water treatment system concepts typically require large land areas, a more viable option for urban communities may be to utilize smaller areas employing infiltration techniques. These ‘infiltration galleries’ or local zero or reduced discharge zones can potentially be established to put more storm-water into vegetated green-space zones in which the water can receive bio-geochemical filtration and treatment as it percolates into groundwater. A potential problem with this system, however, is that infiltration rates must be extremely high in order to maximize the treatment-to-impermeable area. High rates of infiltration, especially if it occurs as macropore flow, may not provide substantial soil-to-water contact time for the adequate treatment of contaminants. Urban storm water runoff also contains a multitude of contaminants (i.e., pathogens, metals, nutrients, DOC, etc.) so a BMP focused to manage volume and which only treats a few contaminants may have little effect on others. Thus, it is essential to evaluate a rapid infiltration basin to assure that the potential surface water benefit

is not detrimental to groundwater.

Methods:
Project Objective 1a: The work proposed for Objective 1 will involve cooperative efforts with the Gaia Institute. The Gaia Institute has constructed the East New York Wetland park along Crescent St. in East New York which consists of two ponds with a stream connection between them (see figure). The system consists of a heterogeneous media of composted organics 45 cm deep overlying construction and debris rubble fill that overlays land in the Jamaica Bay watershed. The area has been planted with blueberries, native shrubs, and other herbaceous plants to create the effect of a storm water capture garden and community pocket park. The monitoring and sampling of runoff through the system will be done intensively over the course of three storm events. The frequency of sampling will be adjusted in subsequent events based on the observations and experienced gained initially. Water samples will be analyzed for pH, nitrate and dissolved P, metals, fecal coliforms, and DOC.

Project Objective 1b: In the laboratory a simplified infiltration simulation system will be set up. This will allow for well-controlled experiments in which the removal mechanism can be studied in detail. Three undisturbed columns will be extracted from the site and some surface material of the overland flow channel will be dug up and brought to the lab in Ithaca. In addition, some storm water runoff will be collected and also brought to Ithaca. In order to study the effectiveness of the infiltration gallery, storm water will be added to the undisturbed columns. This will also be done at three different rates (i.e., maximum infiltration when ponded, half the maximum rate, and at 1 cm/hr).

Project Objective 2: The collected data will be analyzed, evaluated and summarized in a final project report. This summary will be done in the context of performance results, and how the design of this type of pond and infiltration system may be improved or expanded to other areas where urban storm water management is necessary.

Objectives: The goal of this project is to evaluate the development and maintenance of macropore flow in a rapid infiltration basin, and to evaluate the performance and effects on the treatment of the percolating water. The specific objectives are:
1) To monitor and demonstrate the on-site and in the laboratory operational performance of the wetland ponds and infiltration gallery system.
2) To transfer the technical criteria and findings into improved engineering designs for the application of treating urban storm water runoff.
